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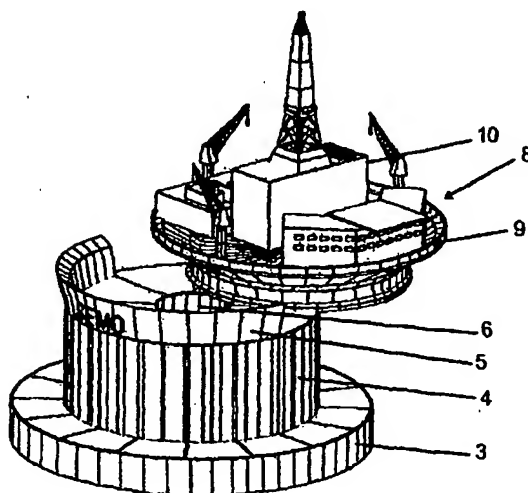
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- (71) Applicant (for all designated States except US): MPU ENTERPRISE AS [NO/NO]; P.O.Box 17, N-1325 Lysaker (NO).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): OLSEN, Tor, Ole [NO/NO]; Dicksvei 10, N-1325 Lysaker (NO). HÆREID, Kåre, O. [NO/NO]; Bestumvn. 75A, N-0283 Oslo (NO). GODEJORD, Arnstein [NO/NO]; Övre Åsvei 31, N-1341
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[Continued on next page]

(54) Title: FLOATING MULTIPURPOSE PLATFORM STRUCTURE AND METHOD FOR CONSTRUCTING SAME



(57) Abstract: The invention relates to floating multipurpose structure (1) for drilling, production and storage of oil and gas, comprising a hull structure (2) with a lower ballastable caisson (brim) (3) and an upwardly extending column (4) for the mounting-on of a deck/hull module (8, 18) in its upper end. The column (4) is in its upper area provided with a combined stability and guiding/fastening device (5) for use during immersing the hull structure (2) and floating/fastening of the deck modules (8, 18). The deck module/hull module (8, 18) are self-floating and in its bottom area provided with a guiding/fastening device (9, 9a). Guiding/fastening devices (9, 9a) of the deck module/hull module (8, 18) form a male coupling which is adapted to the combined stability and guiding/fastening devices (5) of the hull structure (2) which forms a female coupling. The invention also relates to a method for constructing a multipurpose platform structure.

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— with amended claims

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Floating multipurpose platform structure and method for constructing same

This invention relates to a floating multipurpose platform structure for drilling, production and storage of oil and gas including a hull structure with a lower ballastable caisson (brim) and an upwards protruding column on which it can be mounted deck/hull module(s) in its upper end, the column is in its upper
5 area provided with a combined stability and guiding/fastening device for use by immersing the hull structure and in-floating/fastening of the modules, respectively.

The invention also relates to a method for the building of a multipurpose platform structure.

10 For many years there has been a need within the oil and gas industry for floating platform solutions for drilling of wells and for the production of oil and gas. Some of these solutions have the capacity for storing of oil, condensate or other liquid petroleum products.

There exists today many different types of floating platforms for drilling
15 and production. Some of them are well suited for production from fields with underwater wells and flexible risers, while others have been developed especially for solutions with rigid risers and the wellheads above the water. Environmental factors, such as waves, wind and stream will often play a decisive role in the design of the platforms. Having the wellheads on deck
20 means reduced costs for maintaining the wells, and in many cases a better exploitation of the reservoir. There has therefore been a world wide increasing demand for such solutions the last years.

Traditionally tension leg platforms and spar-platforms have been used in connection with dry wells above water. A tension leg platform is anchored to the
25 sea bottom with tendons to reduce vertical movements. The building and installation of this platform structures is relatively expensive, and requires a high degree of accuracy. The spar platform is a long tube, which is necessary in order to obtain satisfactory characteristics of movement. The spar platform might be built for a moderate price, but the building is time consuming and
30 requires deep water for combination with a deck. Other feasible platform solutions within the area of the present invention are the semi platforms, which obtain floating stability by having several spaced columns. The problem with

this type of platform is to obtain satisfactory characteristics of movement and rigidity in the structure, and in this connection reference is made to Norwegian patent no. 173 816.

GB 2311042 describes a system for locating a deck on a platform sub-
5 structure where the deck is arranged with an auxiliary structure on the outside to solve the problem.

An object of the present invention is a floating platform structure which is flexible with regard to environmental conditions such as depth of water, waves, wind and stream. The platform structure should also be flexible with regard to
10 deck loads and furthermore have very good hydrodynamic properties.

Another object is that the platform structure should be flexible with regard to the use on the field, i.e. that the platform in a simple and cost effective way could be equipped with different deck modules as for instance drilling, production and housing modules. The platform structure should also have
15 capacity for storage of oil, condensate or other liquid petroleum products.

A further object of the platform structure is that the costs in connection with marine operations and coupling "hookup" on the field should be lower than for comparable platform solutions.

The objects of the present invention are achieved by a floating
20 multipurpose platform structure according to the introduction of the description and which is characterised by that the deck module/hull module is self floating and in its bottom area is equipped with a guiding/fastening device, and that the guiding/fastening device forms a male coupling which is fitted to the combined stability and guiding/fastening device of the hull structure which forms a female
25 coupling.

Preferred embodiments of the multipurpose platform is detailed in the claims 2 through 8.

The objects of the present invention are further achieved by a process for building up a multipurpose platform structure which is characterised by the
30 features in claim 9.

The multipurpose platform structure according to the present invention will now be explained with reference to the attached figures, where

- Figure 1 shows an embodiment of a hull structure for a multipurpose platform structure according to the invention,
- Figure 2 shows float-in of a deck module according to the invention for installation on the hull structure of Figure 1,
- 5 - Figure 3 shows the floating multipurpose platform structure of Figure 1 and Figure 2 where the deck modules are mounted on the hull structure and the multipurpose platform structure is anchored to the sea bottom,
- Figure 4 is a schematic view of the multipurpose platform structure, and
- Figures 5a – b show a first embodiment of the connection between the hull modules.
- 10 - Figures 6a – b show a second embodiment of the connection between the hull modules.
- Figures 7a – b show a third embodiment of the connection between the hull modules.
- 15 - Figures 8a – b show a fourth embodiment of the connection between the hull modules.
- Figure 9 show an embodiment of the hull structure where a hull module is mounted on to extend the upwardly extending column, and
- Figures 10 - 12 show the hull structure in Figure 9 whereupon there is mounted a first, second and third hull module, respectively.
- 20

Referring to the figures and first with reference to Figure 1 is a hull structure 2 shown with a lower ballastable caisson (brim) 3 and an upwardly extending column 4. The walls of the columns are further in their upper area and around approximately half of the circumference somewhat extended and constitute a combined stability- and guiding/fastening device 5. The extension of column 4 have a dual function as this in the first place entails a positive contribution to the stability of the platform by immersion below e.g. "deck mating" when the upper surface of the columns 4 will be under water. Further this wall should function as a guiding and fastening device 5 in connection with in-floating/fastening of a deck module 8.

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In Figure 2 the deck module 8 is shown as a drilling module 10. The drilling module 10 is self-floating and have a cup-shaped lower part which functions as a buoyant hull and which also constitutes a guiding/fastening

device 9 for mounting of the deck modules 8 on the column 4 of the hull structure. Thus the guiding/fastening device 9 to the deck module 8 will constitute a male coupling which fits together with the combined stability and guiding/fastening device 5 to the hull structure 2 which forms a female coupling.

5 In Figure 3 the deck module 8 is mounted on the hull structure 2 and thus constitutes a floating multipurpose platform structure 1. The hull structure 2 is further deballasted to operational draught and connected to the sea bottom through anchoring 7.

Figure 4 shows a vertical section through the centre of the multipurpose platform structure 1 in Figure 3. Figure 4 is somewhat more detailed than the preceding figures and shows clearly a central opening 6 in the top of the column. The diameter of the opening 6 can gradually be increasing down the column and through the hull structures ballastable caisson 3. The opening 6 adapts to drilling and production of oil and gas through the centre area of the platform structure 1.

The design of the platform structure 1 implies that it can easily be adapted to rigid risers and dry wellheads on deck which means reduced costs as to maintenance of wells and in many cases a better exploitation of the reservoir.

20 The hull structures ballastable caisson (brim) 3 is preferably open to sea and built in concrete, and can contain storage tank for ballast water and possibly petroleum products. The column 4 is preferably built of steel and comprises the storage tank of the platform for ballast water and possibly petroleum products. The shown embodiment of the multipurpose platform structure 1 will thus be a hybrid platform where the hull structure 2 has a lower ballastable caisson 3 of concrete and a column 4 of steel. Such a hybrid solution will have good sea properties, and could be built at low costs also in areas without established building dock.

Figures 5a – b, Figures 6a – b, 7a – b and 8a – b show a first, second, third and fourth embodiment of the connection between the hull structure 2 and a hull module/fastening module 18, respectively. Referring to the figures, it can be seen that the upper area of the column has a dual task, because it shall function as a stability facility for the hull structure under deballasting by "deck

5 mating" and also as a guiding and fastening device for the hull module 18. The upper area of the column 4, i.e. the combined stability and guiding/fastening device 5, will then be shaped in such a way that it during immersion of the hull structure 2 and by float-in of the hull module/fastening module 18 gives the hull structure 2 stability in form of surface area and further functions as a guiding and fastening device 5 in the form of a female coupling which receives the male coupling of the hull module in the form of a guiding/fastening device 9a.

Figure 9 shows the hull structure 2 with the combined stability/fastening device 5. Figure 10, 11 and 12 show the hull structure 2 with 1, 2 and 3 hull modules 18, respectively, mounted on. Each hull module 18 will in its bottom area have a guiding and fastening device 9a which fits together with the guiding and fastening device 5 of the hull structure. Further each hull module 18 will have an upper guiding and fastening device 5a which again will receive the subsequent hull modules lower guiding and fastening device 9a. Thus the column 4 of the hull structures 2 can be built up (extended) by hull modules 18 to the desired height.

A main principle in the present invention is that the deck module/hull module (8, 18) are built self-floating. This can have different shapes and can be a discarded rebuilt deck/hull module or it can be a new built deck/hull module. The actual interconnection of the deck/hull module (8, 18) and the hull structure 2 takes place by preparing the hull structure 2 for being submerged by arranging a top plate at the top of the column 4. Stability and guiding/fastening device 5, 5a will during "deck mating" tower above the water surface and will be the part where the tube arrangement to the deck module/hull module 8, 18 is routed. The stability and guiding/fastening device 5, 5a do not have to be sealed at the top. The hull structure 2 is submerged so deep that the floating deck module 8, 18 can float-in over the top plate of the columns 4. After the deck module/hull module 8, 18 has been moved in and located in position above the hull structure 2, the hull structure 2 is deballasted and the whole deck module/hull module 8, 18 thus will rest on the hull structure 2. It should also be mentioned that the deck module/hull module 8, 18 can be built in two or more parts, and be put together on the top of the hull structure 2 by "deck mating". The principle of self-floating deck module/hull module makes

disassembling of the deck/hull module very simple by the fact that the installation method can be reversed. The solution minimises the costs in connection with marine operations, together with optimising of the fabrication by making the deck module and the hull structure to the highest possible degree as separate units with as little "hookup" as possible. A new built deck/hull module can to a high degree be simplified because the forces during installation are considerably lower than by use of lifting and temporary barges. The force distribution during installation is as much as possible the same as the force distribution during operation, because the deck module/hull module is supported over a large area at the top of the hull structure.

PATENT CLAIMS

1. Floating multipurpose platform structure (1) for drilling, production and storage of oil and gas, including a hull structure (2) with a lower ballastable caisson (brim) (3) and an upwardly extending column (4) for mounting on a deck module/hull module (8, 18) in its upper end, where the column (4) in its upper area is arranged with a combined stability and guiding/fastening device (5) for use by immersing of the hull structure (2) and float-in/fastening of the deck module (8, 18),
characterised in that the deck module/hull module (8, 18) is self-floating and in its bottom area provided with a guiding/fastening device (9, 9a), and that guiding/fastening devices (9, 9a) of the deck module/hull module (8, 18) forms a male coupling which is adapted to the combined stability and guiding/fastening device (5) of the hull structure (2) that forms a female coupling.
2. Floating multipurpose structure according to claim 1,
characterised in that the deck module (8) is an drilling module (10).
3. Floating multipurpose platform structure according to claim 1,
characterised in that the deck module (8) is a production module.
4. Floating multipurpose platform structure according to claim 1,
characterised in that the deck module (8) is a residence (quarter) module.
5. Floating multipurpose platform structure (1) according to anyone of the claims 1-4, characterised in that the combined stability and guiding/fastening device (5) is one or several extensions of the column (4) and extends above parts of the column.
6. Floating multipurpose platform structure according to anyone of the claims 1-5, characterised in that the bottom area of the deck module (8) has a cup like shape.

7. Floating multipurpose platform structure (1) according to claim 1, characterised in that the hull module (18) in its upper area is provided with a guiding/fastening device (5a) for receipt of an adapted guiding/fastening device (9a) to another hull module (18).

8. Floating multipurpose platform structure (1) according to claim 7, characterised in that a number of deck modules (18) are arranged on top of each other.

9. Method for building up a multi purpose platform structure (1) according to anyone of the preceding claims, characterised in that the hull structure (2) is ballasted to a draught, such that the self floating deck module/hull module (8, 18) can be guided into position, deballasted and hence anchored to the hull structure (2), whereafter the hull structure (2) is deballasted to a operational draught.

**[Received by the International Bureau on 13 September 2002 (13.09.02):
original claims 1-9 replaced by amended claims 1-11 (2 pages)]**

1. Floating multipurpose platform structure (1) for drilling, production and storage of oil and gas, including a hull structure (2) with a lower ballastable
5 caisson (brim) (3) and an upwardly extending column (4) for mounting on one or more modules (8, 18) in its upper end, where the column (4) in its upper area is arranged with a combined stability and guiding/fastening device (5) for use by immersing of the hull structure (2) and float-in/fastening of the module (8, 18),
c h a r a c t e r i s e d i n that the module (8, 18) is self-floating and in its
10 bottom area provided with a guiding/fastening device (9, 9a), and that guiding/fastening devices (9, 9a) of the module (8, 18) forms a coupling which is adapted to the combined stability and guiding/fastening device (5) of the hull structure (2) or a underlying module (18) that forms a coupling.
- 15 2. Floating multipurpose platform structure (1) according to claim 1, c h a r a c t e r i s e d i n that the module (18) is a hull module.
3. Floating multipurpose platform structure (1) according to claim 2, c h a r a c t e r i s e d i n that the hull module is a storage tank.
20
4. Floating multipurpose platform structure (1) according to claim 2 or 3, c h a r a c t e r i s e d i n that the hull module (18) in its top area is provided with a guiding/fastening device (5a) for receipt of an adapted guiding/fastening device (9a) to another hull module (18).
25
5. Floating multipurpose platform structure (1) according to claim 2 or 3, c h a r a c t e r i s e d i n that a number of hull modules (18) are stacked onto each other.
- 30 6. Floating multipurpose platform structure according to claim 1, c h a r a c t e r i s e d i n that the module (8) is a deck module.
7. Floating multipurpose platform structure (1) according to claim 6,

characterised in that the deck module (8) is a drilling module (10).

8. Floating multipurpose platform structure according to claim 6,
characterised in that the deck module (8) is a production module.

5

9. Floating multipurpose platform structure according to claim 5,
characterised in that the deck module (8) is a residence module.

10. Floating multipurpose platform structure (1) according to any one of
10 claims 1 - 9,
characterised in that the combined stability and guiding/fastening
device (5) is one or more extensions of the column (4) and extends over parts
of this.

15 11. Process for building up a multipurpose platform structure (1) according to
any one of the preceding claims,
characterised in that the hull structure (2) is ballasted to a draught,
so that the self-floating module (8, 18) can be steered into position, deballasted
and in this way be anchored to the hull structure (2) or the underlying module
20 (18), whereafter the hull structure (2) is deballasted to a operational draught.

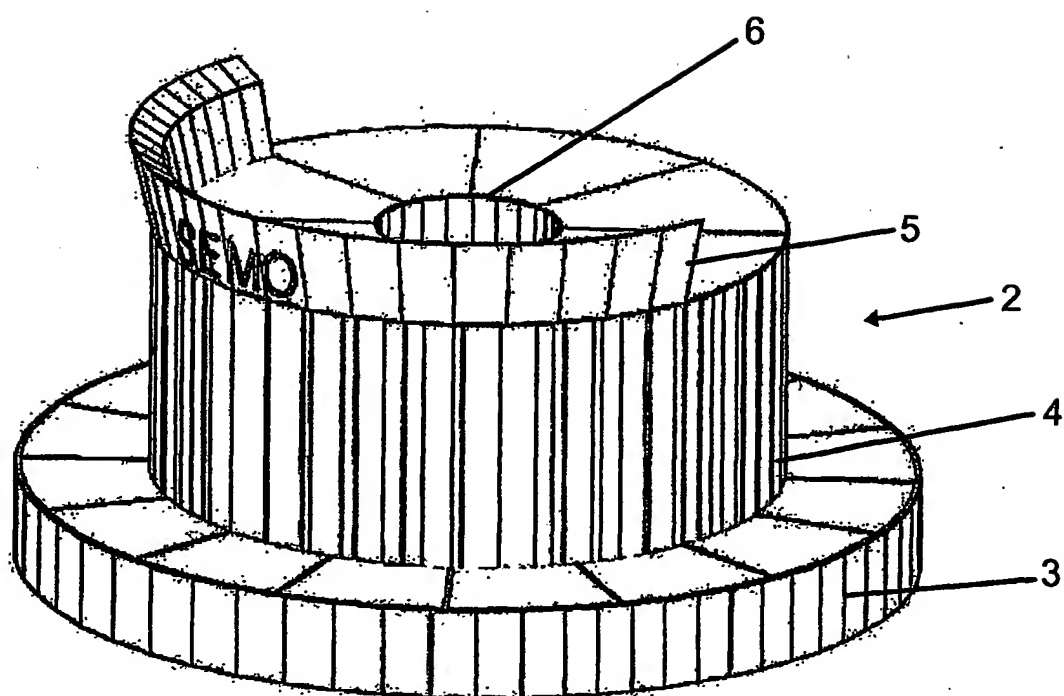


FIG. 1

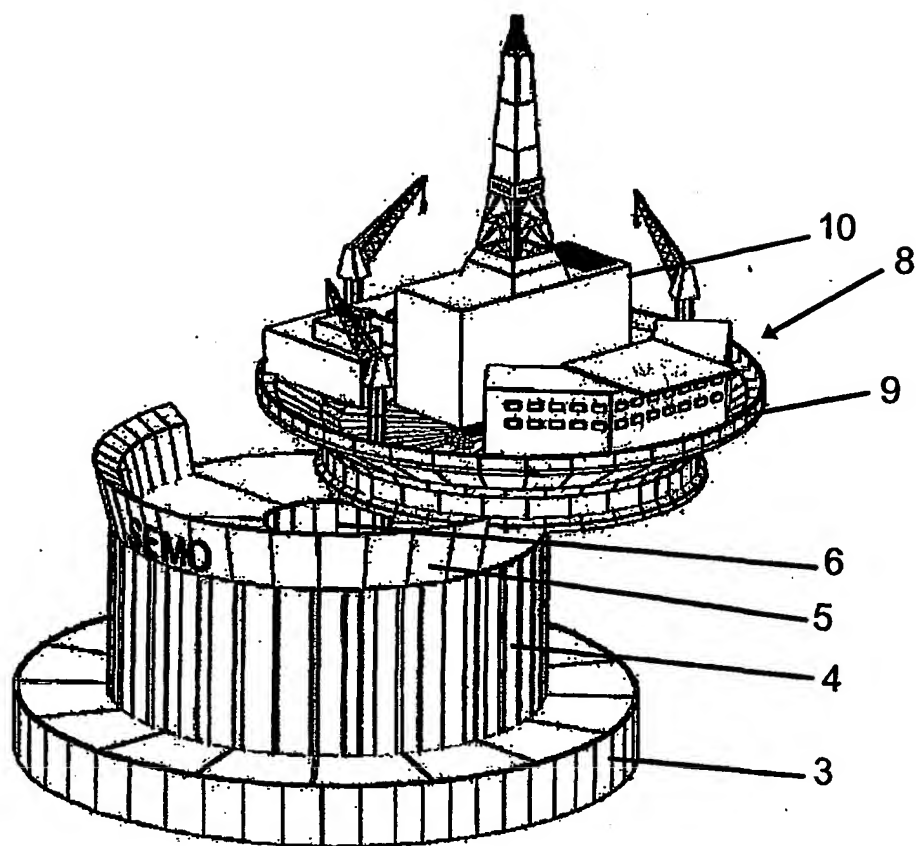


FIG. 2

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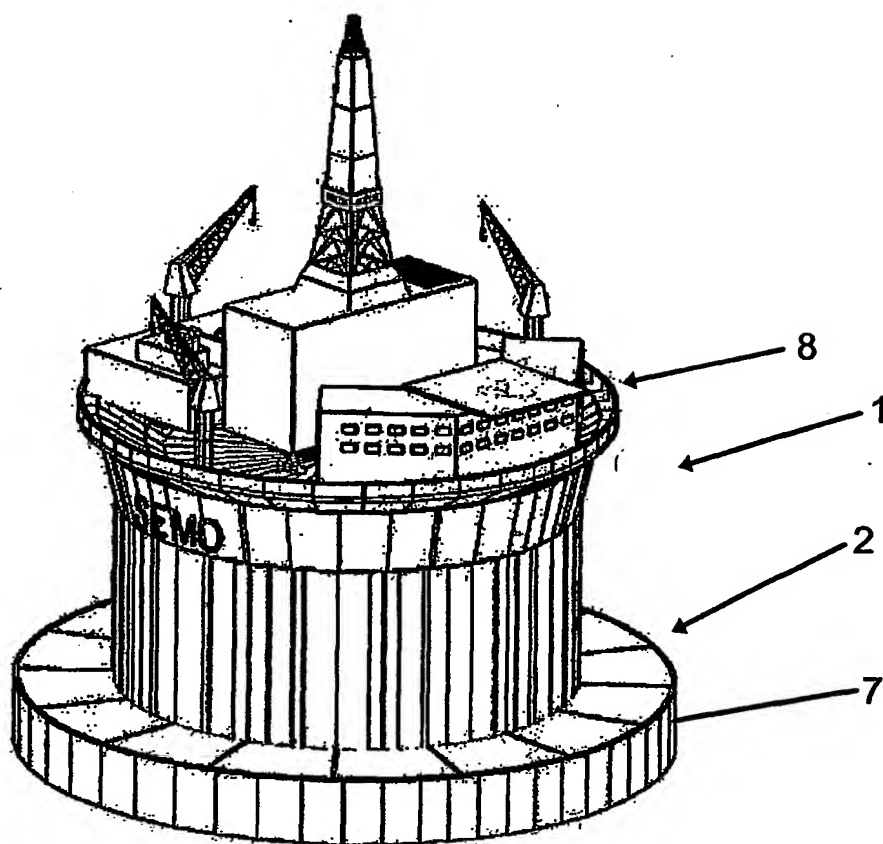


FIG. 3

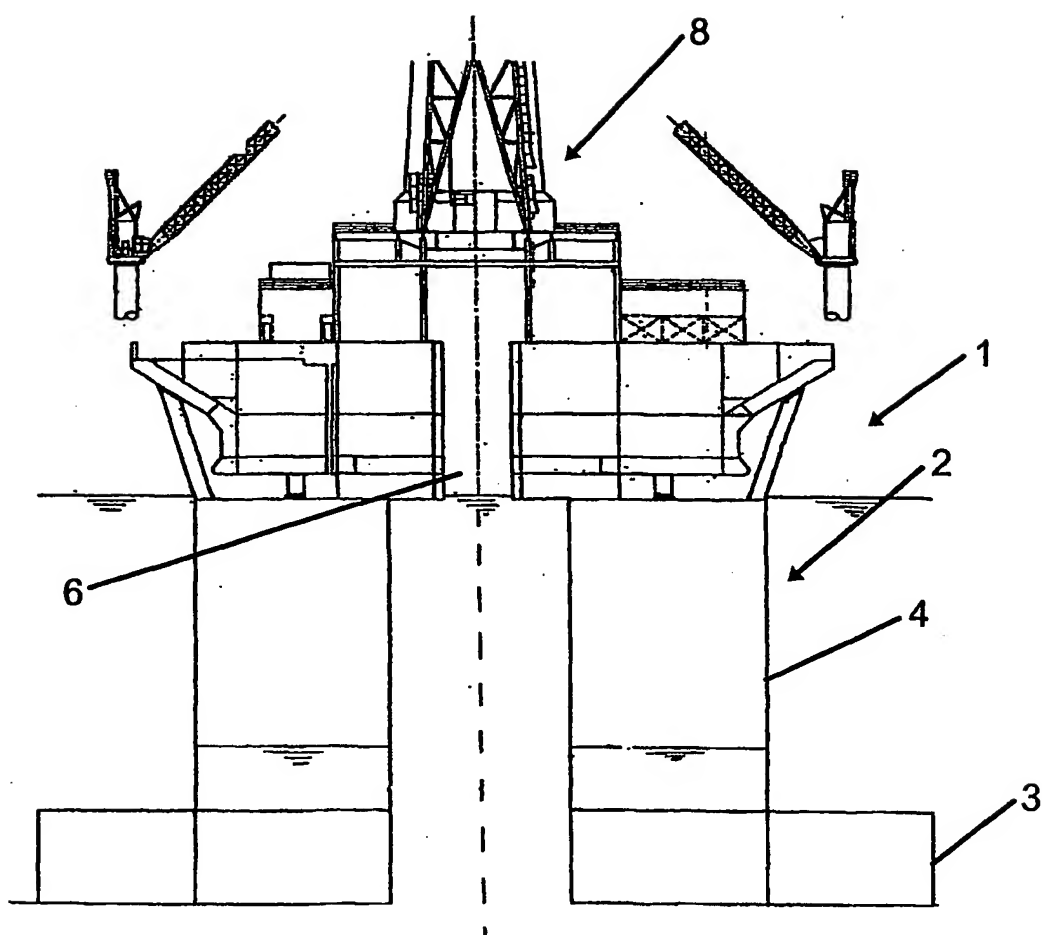


FIG. 4

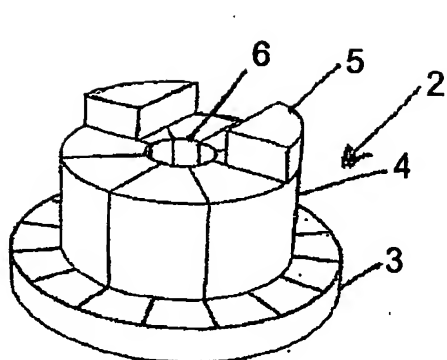


FIG. 5a

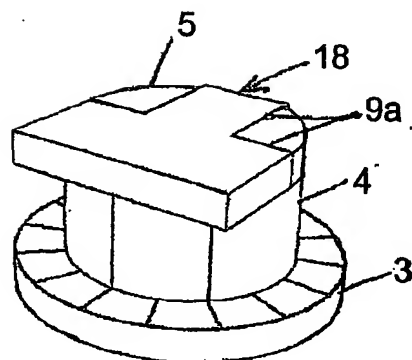


FIG. 5b

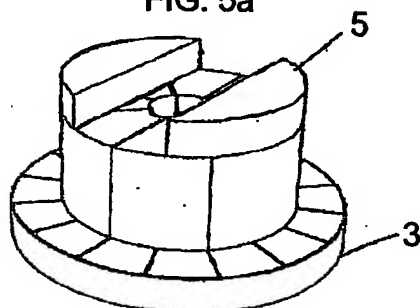


FIG. 6a

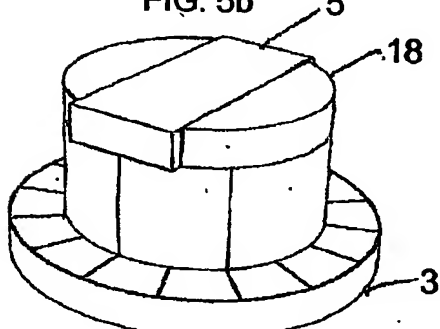


FIG. 6b

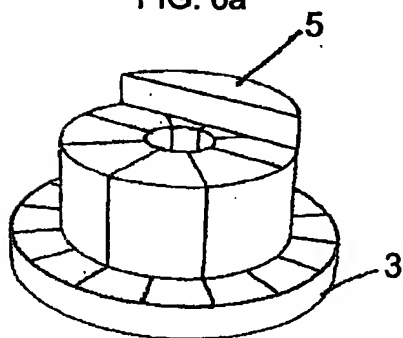


FIG. 7a

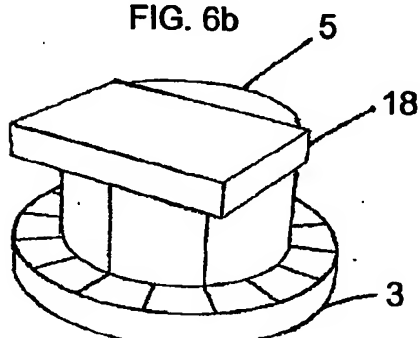


FIG. 7b

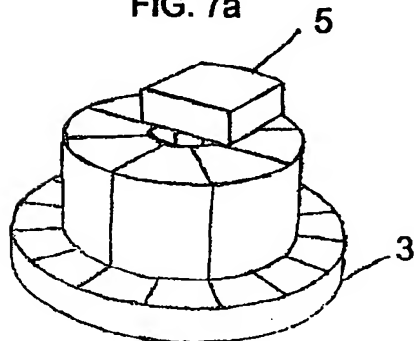


FIG. 8a

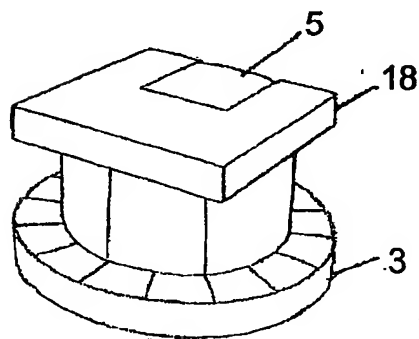


FIG. 8b

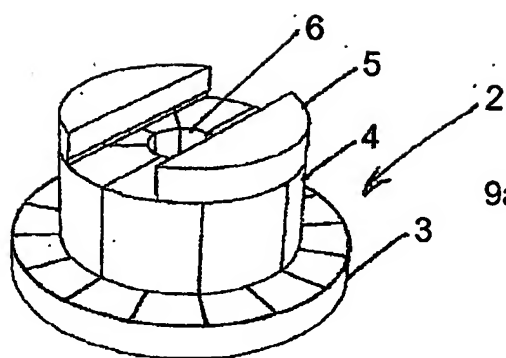


FIG. 9

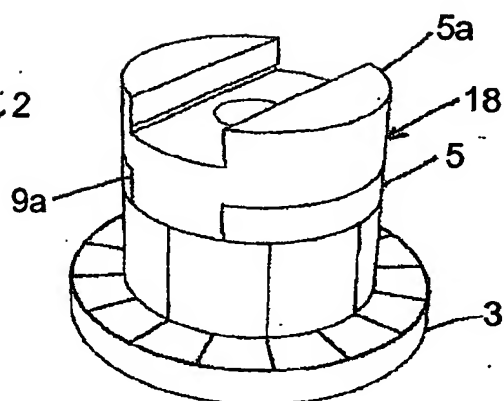


FIG. 10

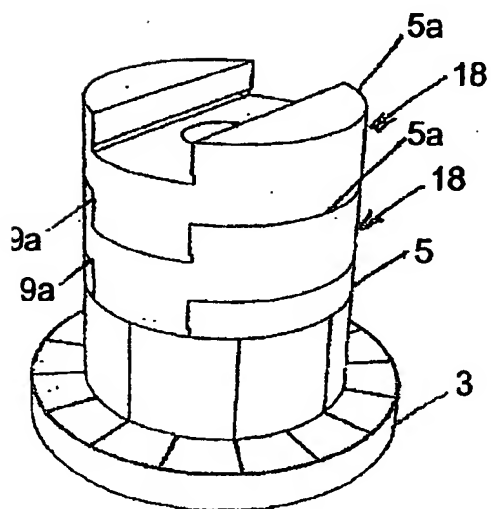


FIG. 11

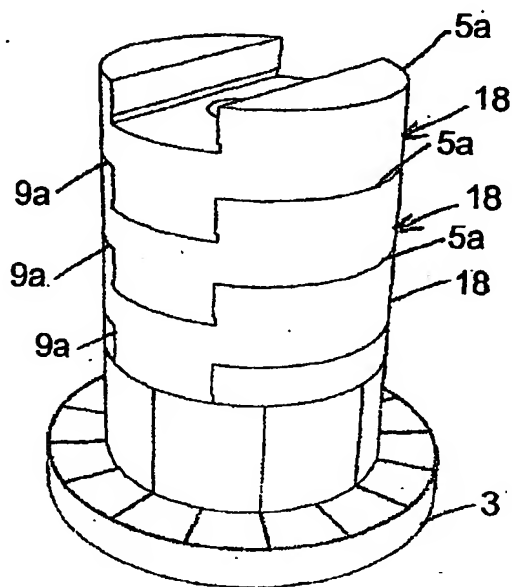


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 02/00159

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B63B 35/44, E02B 17/00 // B63B 9/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B63B, E02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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17 July 2002

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Authorized officer

Swedish Patent Office

Douglas Elliot/SN

Box 5055, S-102 42 STOCKHOLM

Telephone No. +46 8 782 25 00

Facsimile No. +46 8 666 02 86

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 02/00159

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 4995762 A (GOLDMAN), 26 February 1991 (26.02.91)</p> <p style="text-align: center;">-- -----</p>	1-9

INTERNATIONAL SEARCH REPORT
Information on patent family members

06/07/02

International application No.

PCT/NO 02/00159

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